REMARKS

On page 2 of the Action, claims 1-3, 9-11, 13-18, 20 and 22-23 were rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter. Also, on page 3 of the Action, claims 1-2, 9-11, 13-15 and 20 were rejected under 35 U.S.C. 103(a) as being unpatentable over Furukawa et al. in view of Siebert et al.

In view of the rejections, claims 1, 5, 8, 10 and 15 have been amended to clarify the features of the invention and alleviate the rejections.

As cited in claim 1, a brake apparatus of the invention has a service braking system and a regenerating braking system. At least one of the service braking system and the regenerating braking system applies a braking force to wheels upon providing a braking operation.

The brake apparatus comprises a master cylinder for operating the service braking system having an input shaft which travels according to travel of a brake operational member by the braking operation, a master cylinder pressure chamber, and a master cylinder piston which develops a master cylinder pressure in the master cylinder pressure chamber according to a travel of the input shaft; a braking force control device having a pump and controlling, in a service braking operation, a discharge pressure of the pump according to the operational conditions of the service braking system and the regenerating braking system; a controller for operating the pump according to the master cylinder pressure; and a wheel cylinder for receiving the brake fluid at the discharge pressure controlled by the braking force control device and generating the braking force. Upon operation by the controller, the pump sucks brake fluid from the master cylinder pressure

chamber and discharges the brake fluid at the discharge pressure controlled by the braking force control device.

In the invention, a travel modulating device has a travel modulating piston to which the discharge pressure at the wheel cylinder is applied, and a modulating spring for urging the travel modulating piston. The travel modulating piston modulates the travel of the brake operational member in the service braking operation to become substantially the same in a braking actuation when the regenerating braking system applies the braking force and in a braking actuation when the regenerating braking system does not apply the braking force.

Namely, in the invention, the pump sucks the brake fluid from the master cylinder pressure chamber and discharges to the wheel cylinder at the discharge pressure controlled by the braking force control device to thereby generate the braking force. The braking force control device controls a discharge pressure of the pump according to the operational condition of the service braking system, i.e. whether the regenerating braking system is operated or not. The travel modulating device includes the travel modulating piston and the modulating spring, wherein the travel modulating piston modulates the travel of the brake operational member in the service braking operation to become substantially the same in a braking actuation when the regenerating braking system applies the braking force and in a condition when the regenerating braking system does not apply the braking force.

Accordingly, the travel of the operational member can remain the same as for the service braking even if the braking pressure for the wheel is changed relative to the same input according to the service braking operation and the regenerative braking operation.

In Seibert et al., a pressure control valve 12 controls a discharge pressure from a pump 10 according to a master cylinder

pressure generated by a master cylinder 1 formed by pushing a brake pedal 22. The master cylinder pressure switches and controls multidirectional valves 31-34. Thus, the discharge pressure from the pump 10 is supplied to brake wheels 4-7 controlled according to the master cylinder pressure to thereby generate the braking force. At this time, the pedal stroke as desired by a driver is obtained by a stopping distance simulator 37.

In the invention, the pump sucks the break fluid from the master cylinder pressure chamber and discharges the brake fluid at the discharge pressure controlled by the braking force control device. In Seibert et al., the pump 10 sucks the break fluid from a pressure compensating and pressure fluid reservoir 13, not from the master cylinder pressure chamber.

In the invention, the braking force control device controls a discharge pressure of the pump according to the operational conditions of the service braking system and the regenerating braking system. In Seibert et al., the pressure control valve 12 controls the discharge pressure from the pump 10 according to the master cylinder pressure generated by the master cylinder 1, but not according to the condition of the regenerating braking.

In the invention, the travel modulating piston modulates the travel of the brake operational member in the service braking operation to become substantially the same in a braking actuation when the regenerating braking system applies the braking force and in a braking actuation when the regenerating braking system does not apply the braking force. In Seibert et al., the stopping distance simulator 37 is used, but it does not constitute the travel modulating device, which modulates the travel of the operational member to become substantially the same in the different braking conditions.

Namely, in the braking system in Seibert et al., the discharge pressure of the pump or the pressure of the accumulator, not the

master cylinder pressure, is controlled according to the pushing force of the pedal, and is supplied to the wheel cylinder. This is a conventional braking system.

The stroke or travel regulation device of Seibert et al. operates to control a pedal stroke or travel at the time of generating MCY pressure by a pump discharge pressure regulated by a brake force control device at the time of generating the MCY pressure. In the braking system of Siebert et al., the pedal stroke at the time of generating the MCY pressure can be controlled, but in the regenerating brake condition, when the brake by the pump discharge pressure regulated by the brake force regulating device is operated, by properly controlling the entire braking torque, the pedal stroke may be handled to be different from the pedal stroke at the time of brake operation only by the pump discharge pressure. However, the pedal stroke can not become the same as the pedal stroke at the time of the brake operation only by the pump discharge pressure.

Therefore, the features of the invention are not disclosed or suggested in Seibert et al.

In Furukawa et al., a regular braking system and a regenerating braking system are used. At the time of braking, an entire braking torque including at least one of frictional braking torque and regenerating braking torque is applied to each wheel. If one of the wheels is locked at the time of braking, the regenerating braking torque is changed to zero, and the frictional braking torque is regulated such that the slipping wheel comes to a normal condition.

In Furukawa et al, in order to prevent a stroke or travel of a brake pedal 76 from becoming zero when shut-off valves 90, 92 are both closed in the regenerating braking cooperation control or anti-lock braking control, a stroke simulator 228 is provided in a fluid passage 80. A constant hydraulic pressure source 70 includes

a master reservoir 84, a pump 85 and an accumulator 86. The working fluid (braking fluid) in the master reservoir 84 is pressurized by the pump 85, and the pressurized fluid is stored in the accumulator 86.

In the stoke simulator 228, however, when the shut-off valves 90, 92 are both closed, the brake pedal can not be moved. Thus, the stoke simulator 228 is used to obtain a stroke or travel for the brake pedal 76. Therefore, in the brake system of Furukawa et al., a wheel can be braked by an entire braking torque including at least one of a frictional braking torque and a regenerating braking torque. When the shut-off valves 90, 92 operate by, such as anti-locking control, the pedal stroke or travel can be obtained. However, when the regular brake by the MCY pressure is operated at the time of operation of the regenerating braking, the pedal stroke tries to change to be different from the pedal stroke at the time of braking operation only by the regular braking operation, this pedal stroke can not be made as in the braking operating only by the regular braking operation.

In the invention, the travel modulating piston modulates the travel of the brake operational member in the service braking operation to become substantially the same in a braking actuation when the regenerating braking system applies the breaking force and in a condition when the regenerating braking system does not apply the breaking force. Therefore, the features of the invention are not disclosed or suggested in Furukawa et al.

As explained above, the cited references do not disclose or suggest the features of the invention. Even if the cited references are combined, the invention is not obvious from the cited references.

Reconsideration and allowance are earnestly solicited.

Respectfully Submitted,

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